In the Claims

1-65. (Cancelled)

66. (Currently Amended) A method for analyzing a polymer comprising:

providing the polymer having first and second unit specific markers, the first unit specific marker including a first label and the second unit specific marker including a second label, wherein the first and second unit specific markers are spaced apart on the polymer by a separation distance;

providing a detection zone adapted to detect emission signals, the detection zone characterized by a zone distance;

moving the polymer through the detection zone at a velocity;

detecting signals emitted from the label of the first unit specific marker before and after a first timing event as the first unit specific marker passes through the detection zone, to define a first emission signal;

calculating ~~identifying~~ a proportion of the first emission signal that corresponds to a distance of the detection zone traversed by the label of the first unit specific marker at the first timing event;

detecting signals emitted from the label of the second unit specific marker before and after a second timing event as the second unit specific marker passes through the detection zone, to define a second emission signal;

calculating ~~identifying~~ a proportion of the second emission signal that corresponds to a distance of the detection zone traversed by the label of the second unit specific marker at the second timing event;

determining the separation distance at a precision greater than the zone distance by comparing the proportion of the first emission signal and the proportion of the second emission signal; and

outputting an indication of the separation distance to a user.

67. (Currently Amended) The method of claim 66, wherein calculating ~~identifying~~ the proportion of the first emission signal that corresponds to the distance of the detection zone that has been traversed by the label of the first unit specific marker at the first timing event comprises dividing the signal emitted from the label of the first unit specific marker before the first timing event by the first emission signal.

68. (Currently Amended) The method of claim 67, wherein calculating ~~identifying~~ the proportion of the second emission signal that corresponds to the distance of the detection zone that has been traversed by the label of the second unit specific marker at the second timing event comprises dividing the signal emitted from the label of the second unit specific marker before the second timing event by the second emission signal.

69. (Withdrawn – Currently Amended) The method of claim 66, wherein calculating ~~identifying~~ the proportion of the first emission signal that corresponds to the distance of the detection zone that has been traversed by the label of the first unit specific marker at the first timing event comprises dividing the signal emitted from the label of the first unit specific marker after the first timing event by the first emission signal.

70. (Withdrawn – Currently Amended) The method of claim 69, wherein calculating ~~identifying~~ the proportion of the second emission signal that corresponds to the distance of the detection zone that has been traversed by the label of the second unit specific marker at the second timing event comprises dividing the signal emitted from the label of the second unit specific marker after the second timing event by the second emission signal

71. (Previously Presented) The method of claim 66, wherein the first label and the second label are distinct types of labels.

72. (Currently Amended) The method of claim 71, wherein the first and second timing events are a single timing event for calculating ~~identifying~~ the proportion of the first emission signal and calculating ~~identifying~~ the proportion of the second emission signal.

73. (Previously Presented) The method of claim 72, wherein determining the separation distance comprises

multiplying the proportion of the first signal and the proportion of the second signal by the zone distance to define a first distance and a second distance, respectively; and

then subtracting the second distance from the first distance to define the separation distance.

74. (Withdrawn) The method of claim 72, wherein determining the separation distance comprises

subtracting the proportion of the second signal from the proportion of the first signal to define a separation factor; and

then multiplying the separation factor by the zone distance to define the separation distance.

75. (Withdrawn) The method of claim 71, wherein the first and second timing events comprise two distinct timing events, the first timing event for calculating ~~identifying~~ the proportion of the first emission signal and the second timing event that occurs one reset time immediately after the first timing event, the second timing event for calculating ~~identifying~~ the proportion of the second emission signal.

76. (Withdrawn) The method of claim 75, further comprising:

calculating a reset distance by multiplying the velocity by the reset time;

wherein determining the separation distance comprises multiplying the proportion of the first signal and the proportion of the second signal by the zone distance to define a first distance and a second distance, respectively;

then subtracting the second distance from the first distance; and

then adding the reset distance to the first distance to define the separation distance.

77. (Withdrawn) The method of claim 75, further comprising:

calculating a reset distance by multiplying the velocity by the reset time;

wherein determining the separation distance comprises subtracting the proportion of the second signal from the proportion of the first signal to define a separation factor;

then multiplying the separation factor by the zone distance; and

then adding the reset distance to define the separation distance.

78. (Withdrawn) The method of claim 66, wherein the first and second timing events comprise two distinct timing events, the first timing event for calculating the proportion of the first emission signal and the second timing event that occurs later and is separated by one or more timing events within a series of timing events, the second timing event for calculating the proportion of the second emission signal.

79. (Withdrawn) The method of claim 78, further comprising:

calculating a reset distance by multiplying the velocity by the reset time;

wherein determining the separation distance comprises multiplying the proportion of the first emission signal and the proportion of the second emission signal by the zone distance to define a first distance and a second distance, respectively; and

further wherein the second distance is subtracted from the first distance and a number of reset distances equivalent to the number of timing events, are added to the first distance to define the separation distance.

80. (Withdrawn) The method of claim 78, further comprising:

calculating a reset distance by multiplying the velocity by the reset time;

wherein determining the separation distance comprises subtracting the proportion of the second emission signal from the proportion of the first emission signal; and

further wherein the separation factor is multiplied by the zone distance and a number of reset distances, equivalent to the number of timing events, are added to define the separation distance.

81. (Withdrawn) The method of claim 79, wherein the first label and the second label comprise similar types of labels.

82. (Withdrawn) The method of claim 79, wherein the first label and the second label are distinct types of labels.

83. (Withdrawn) The method of claim 80, wherein the first label and the second label comprise similar types of labels.

84. (Withdrawn) The method of claim 80, wherein the first label and the second label are distinct types of labels.

85. (Withdrawn) The method of claim 84, wherein the first unit specific marker is different from the second unit specific marker.

86. (Withdrawn) The method of claim 83, wherein the first unit specific marker is identical to the second unit specific marker.

87. (Withdrawn) The method of claim 86, wherein the polymer is labeled with a third unit specific marker comprising a third label.

88. (Previously Presented) The method of claim 66, wherein the first and second unit specific markers are nucleic acid molecules.

89. (Previously Presented) The method of claim 66, wherein the first and second unit specific markers are peptide nucleic acid molecules or locked nucleic acid molecules.

90. (Previously Presented) The method of claim 66, wherein the first and second unit specific markers have an identical nucleotide sequence.

91. (Previously Presented) The method of claim 66, wherein the first and second unit specific markers are less than 12 bases in length.

92. (Previously Presented) The method of claim 66, wherein the first and second unit specific markers are at least 4 bases in length.

93. (Previously Presented) The method of claim 66, wherein the first label and second label are selected from the group consisting of an electron spin resonance molecule, a fluorescent molecule, a chemiluminescent molecule, a radioisotope, an enzyme substrate, an enzyme, a biotin molecule, an avidin molecule, an electrical charge transferring molecule, a semiconductor nanocrystal, a semiconductor nanoparticle, a colloid gold nanocrystal, a ligand, a microbead, a magnetic bead, a paramagnetic molecule, a quantum dot, a chromogenic substrate, an affinity molecule, a protein, a peptide, a nucleic acid, a carbohydrate, a hapten, an antigen, an antibody, an antibody fragment, and a lipid.

94. (Previously Presented) The method of claim 66, wherein the signals are detected using a detection system selected from the group consisting of an electron spin resonance (ESR) detection system, a charge coupled device (CCD) detection system, a fluorescent detection system, an electrical detection system, an electromagnetic detection system, a photographic film detection system, a chemiluminescent detection system, an enzyme detection system, an atomic force microscopy (AFM) detection system, a scanning tunneling microscopy (STM) detection system, an optical detection system, a nuclear magnetic resonance (NMR) detection system, a near field detection system, and a total internal reflection (TIR) detection system.

95. (Previously Presented) The method of claim 66, wherein the polymer is a nucleic acid molecule.

96. (Previously Presented) The method of claim 66, wherein the polymer is genomic DNA or RNA.

97. (Previously Presented) The method of claim 66, wherein the polymer comprises a backbone that includes a label.

98. (Withdrawn) The method of claim 75, wherein the reset time is between 0.01 and 1000 milliseconds.

99. (Previously Presented) The method of claim 66, wherein the detection zone is circular and the zone distance is a diameter of the detection zone.

100-136. (Cancelled)

137. (Currently Amended) A method comprising:

moving through a detection zone a polymer bound to a first labeled unit specific marker and a second labeled unit specific marker, wherein the first and second unit specific markers are spaced apart by a separation distance,

detecting signals that define a first emission signal and are emitted from the first labeled unit specific marker, before and after a first timing event, as the first labeled unit specific marker pass through the detection zone,

detecting signals that define a second emission signal and are emitted from the second labeled unit specific marker, before and after a second timing event, as the second labeled unit specific marker passes through the detection zone,

determining a proportion of the first emission signal that corresponds to a distance of the detection zone traversed by the first labeled unit specific marker at the first timing event,

determining a proportion of the second emission signal that corresponds to a distance of the detection zone traversed by the second labeled unit specific marker at the second timing event,

determining the separation distance by ~~comparing~~ calculating the proportion of the first emission signal and the proportion of the second emission signal; and

outputting an indication of the separation distance to a user.